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LII. Observations upon the Comet that appeared in the Months of September and October 1757, made at the Royal Observatory by Ja. Bradley, D. D. Astronomer Royal, F. R. S. and Member of the Royal Academy of Sciences at Paris.

Read Dec. 22, 1757. **I** Deferred to give an account of my observations upon the Comet that hath lately appeared, till I could settle the places of the stars with which it had been compared; several of them not being inserted in the British catalogue, and those which are, requiring some small corrections, which I have since made from my own observations.

When I first discovered this Comet, it appeared to the naked eye like a dull star of the 5th or 6th magnitude; but viewing it thro' a seven-foot Telescope, I could perceive a small Nucleus (surrounded, as usual, with a nebulous atmosphere), and a short tail extended in a direction opposite to the sun.

Some small stars then appearing in the field of the telescope with the Comet, I measured its distance from them with a Micrometer; and on September 12^d at 16^h 2' mean time, I found it to be 1° 13' 5" distant from a small star, whose right ascension was afterwards found to be 89° 49' 40" and declination 36° 11' 30" north: and near the same time the Comet was observed to be 43' 10" from another star, whose right ascension was 90° 20' 0" and declination 35° 12' 0" north.

Hence

Hence I collected, that the Comet's right ascension was $89^{\circ} 29' 10''$ and its declination $35^{\circ} 0' 20''$ north.

September $13^d 12^h 37'$ mean time (which is likewise made use of in the following observations), the Comet had the same right ascension with a small star, whose right ascension was $93^{\circ} 5' 30''$ and declination $34^{\circ} 36' 40''$ north; and it was about two minutes more northerly than the star. Hence the Comet's right ascension was $93^{\circ} 5' 30''$ and its declination $34^{\circ} 38' 40''$ north.

September $14^d 14^h 0'$ the Comet preceded θ Geminorum $1^{\circ} 31' 35''$ in right ascension, and was $11' 35''$ more southerly. The apparent right ascension of θ Geminorum was then $99^{\circ} 11' 40''$ and its declination $34^{\circ} 13' 25''$ north. Hence the right ascension of the Comet was $97^{\circ} 40' 5''$ and its declination $34^{\circ} 1' 50''$ north.

Sept. $17^d 13^h 0'$ a small star (whose right ascension was $109^{\circ} 55' 20''$ and declination $31^{\circ} 27' 40''$) preceded the Comet $47' 10''$ in right ascension, and was $12' 30''$ more northerly. Hence the Comet's right ascension was $110^{\circ} 42' 40''$ and its declination $31^{\circ} 15' 10''$ north.

Sept. $19^d 15^h 17'$ a star (whose right ascension was $118^{\circ} 29' 40''$ and declination $28^{\circ} 9' 45''$) preceded the Comet $1^{\circ} 14' 0''$ in right ascension, and was more southerly $15' 45''$. Hence the Comet's right ascension was $119^{\circ} 43' 40''$ and declination $28^{\circ} 25' 30''$ north.

Sept. $23^d 15^h 57'$ a star (whose right ascension was $134^{\circ} 55' 45''$ and declination $22^{\circ} 15' 55''$ north) preceded the Comet $12' 30''$ in right ascension, and

was $29^{\circ} 0''$ more northerly. Hence the Comet's right ascension was $135^{\circ} 8' 15''$ and its declination $21^{\circ} 46' 55''$ north.

Sept. $24^d 15^h 21'$ the Comet had the same declination with a small star that preceded it $10' 15''$ in right ascension. This star's right ascension was afterwards found to be $138^{\circ} 13' 45''$ and its declination $20^{\circ} 5' 20''$. Hence the Comet's right ascension was $138^{\circ} 24' 0''$ and its declination $20^{\circ} 5' 20''$ north.

Sept. $28^d 16^h 22'$ the Comet followed Regulus $1^{\circ} 7' 12''$ in right ascension, and was $14' 45''$ more northerly. The right ascension of Regulus being then $148^{\circ} 51' 13''$ and its declination $13^{\circ} 8' 35''$ north; the Comet's right ascension was $149^{\circ} 58' 25''$ and its declination $13^{\circ} 23' 20''$ north.

Sept. $30^d 16^h 24'$ β Leonis (whose right ascension was $155^{\circ} 0' 10''$ and declination $10^{\circ} 32' 53''$ north) followed the Comet $18' 45''$ in right ascension, and was $7' 53''$ more northerly. Hence the Comet's right ascension was $154^{\circ} 41' 25''$ and its declination $10^{\circ} 25' 0''$ north.

October $2^d 16^h 48'$ the 37th star Sextantis. Hevel. in the British Catalogue (whose right ascension was $158^{\circ} 21' 25''$ and declination $7^{\circ} 38' 40''$ north) preceded the Comet $32' 50''$ in right ascension, and was $3' 20''$ more southerly. Hence the Comet's right ascension was $158^{\circ} 54' 15''$ and its declination $7^{\circ} 42' 0''$ north.

October $3^d 16^h 45'$ ϵ Leonis (whose right ascension was $162^{\circ} 2' 15''$ and declination $7^{\circ} 24' 0''$ north) followed the Comet $1^{\circ} 12' 55''$ in right ascension, and was $56' 40''$ more northerly. Hence the Comet's right ascension was $160^{\circ} 49' 20''$ and its declination $6^{\circ} 27' 20''$ north.

October 4^d 17^h 0' *d* Leonis (whose right ascension was 162° 0' 15" and declination 4° 54' 57" north) preceded the Comet 40' 15" in right ascension, and was more southerly 20' 53". Hence the Comet's right ascension was 162° 40' 30" and its declination 5° 15' 50" north.

October 7^d 16^h 54' the 79th Leonis in the British Catalogue (whose right ascension was 167° 53' 37" and declination 2° 44' 15" north) followed the Comet 13' 0" in right ascension, and was more northerly 38' 35". Hence the Comet's right ascension was 167° 40' 37" and its declination 2° 5' 40" north.

October 8^d 16^h 53' the Comet preceded *v* Leonis 1° 53' 30" in right ascension, and was 37' 20" more northerly. The right ascension of this star was 171° 7' 45" and its declination 0° 30' 55" north; therefore the Comet's right ascension was 169° 14' 15" and its declination 1° 8' 15" north.

October 11^d 16^h 52' the Comet followed *v* Leonis 2° 33' 30" in right ascension, and appeared 1° 55' 5" more southerly; but it being near the horizon, the difference of right ascension must have been contracted by refraction about 1' 5", and the difference of declination about 1' 30": so that the corrected right ascension of the Comet was 173° 42' 20" and its declination 1° 25' 40" south.

Immediately after this observation a fog arose, which prevented me from repeating it; and several mornings following proving hazy or cloudy, I could not see the Comet again till October 18th, about an hour and a quarter before sun-rising; when the twilight being strong, and the Comet low, it appeared very faint. However, I was unwilling to omit the

opportunity of determining its place, as near as I could, by a single observation, in the following manner.

At $6^h 59' 54'' \frac{1}{2}$ sidereal time, I observed the passage of the Comet over the perpendicular wire of my equatorial Sector; then leaving the instrument in the same position till the next evening, I observed, that at $22^h 8' 15''$ sidereal time, the 17th star of Eridanus in the British Catalogue passed over the same wire (or horary circle) $9' 30''$ more southerly than the Comet. And at $23^h 45' 36''$ sidereal time the star marked *b* in Eridanus passed, $19' 55''$ more northerly than the Comet.

I found that the situation of my instrument was not sensibly altered between the 18th and 19th of October; for the transits and the difference of declination of the same stars being observed with it again on the 19th of October, they agreed very well with those that were taken the preceding night. It may therefore be supposed, that the position of the instrument continued the same likewise during the time of the foregoing observations.

The right ascension of the 17th star of Eridanus being $49^\circ 39' 10''$ and its declination $5^\circ 55' 25''$ south; and the right ascension of *b* of Eridanus being $73^\circ 59' 25''$ and its declination $5^\circ 25' 10''$ south; I collected, that when the Comet passed the wire (or horary circle) which was October $17^d 17^h 12'$ mean time, its right ascension was $182^\circ 34' 0''$ and its declination $5^\circ 45' 35''$ south.

The last time that I saw the Comet was on the 19th of October in the morning; but it then appeared so faint, that I could not observe its place. Its elongation from the sun was then but about 20 degrees;

degrees ; and from that day to the present it hath always been less ; which is the principal reason why it was invisible to us at the time when it was in its perihelion, and hath remained so ever since. The elongation will indeed soon become greater, and yet it is probable that we shall not be able to see the Comet again ; because its real distance from the sun will be greater than it was when I first saw it, and it will be also four times further from us than it was at that time.

The Comet kept nearly at the same distance from the earth for ten or twelve days together after I first saw it ; but its brightness gradually increased then, because it was going nearer to the sun. Afterwards, when its distance from the earth increased, altho' it continued to approach the sun, yet its lustre never much exceeded that of stars of the second magnitude, and the tail was scarce to be discerned by the naked eye.

All the forementioned observations were made with a Micrometer in a seven-foot Tube, excepting those of the 3d, 11th, and 17th days of October, which were taken with a curious Sector constructed for such purposes by the late ingenious Mr. George Graham ; of which Dr. Smith has given a very exact description in his third book of Optics.

Supposing the Trajectory of this Comet to be parabolic, I collected from the foregoing observations, that its motion round the sun is *direct*, and that it was in its *perihelion* October the 21st, at 7^h 55' mean (or equated) time at Greenwich. That the inclination of the plane of its Trajectory to the ecliptic is 12° 50' 20"; the place of the descending Node \propto 4°

12' 50"; the place of the Perihelion Ω $2^{\circ} 58' 0''$; the distance of the Perihelion from the descending Node $88^{\circ} 45' 10''$; the Logarithm of the Perihelion distance 9.528328; the Logarithm of the diurnal motion 0.667636.

From these Elements (which are adapted to Dr. Halley's general Table for the Motion of Comets in parabolic Orbits), I computed the places of this Comet for the respective times of the foregoing observations, as in the following table; which contains likewise the longitudes and latitudes deduced from the observed right ascensions and declinations, and also the differences between the computed and observed places. These differences (no-where exceeding $40''$) shew, that the elements here set down will be sufficient to enable future astronomers to distinguish this Comet upon another return; but as they do not correspond with the elements of the orbit of any other Comet hitherto taken notice of, we cannot determine at present the period thereof.

Greenwich, 1757. Mean Time.		Comet. Long. Obsrv.		Latit. Obsrv.		Long. Comp.		Latit. Comput.		Diff. Long.		Diff. Latit.	
d.	b.	S.	°	'	"	S.	°	'	"	°	'	°	'
Sept. 12	16	II	29	34	13	II	29	34	11	11	32	20	No.
13	12	23	2	35	34	23	2	35	47	11	12	11	
14	14	23	6	27	45	23	6	27	42	10	43	43	
17	13	23	17	49	40	23	17	50	16	9	3	11	
19	15	23	26	6	8	23	26	5	50	7	36	30	
23	15	23	11	19	18	23	11	19	4	4	33	32	
24	15	24	14	44	19	24	14	44	3	3	49	39	
28	16	24	27	23	43	28	27	23	32	1	3	52	No.
30	16	24	22	45	43	30	22	45	39	0	5	17	So.
Octob. 2	16	24	7	37	43	2	7	37	42	1	5	32	
3	16	24	9	51	36	3	9	51	29	1	31	55	
4	17	24	12	1	4	4	12	0	25	1	56	23	
7	16	24	17	51	3	7	17	51	6	2	56	24	
8	16	24	19	39	45	8	19	39	33	3	12	28	
11	16	24	24	47	22	11	24	47	47	3	49	29	
17	17	24	4	38	58	17	4	38	36	4	15	2	So.